

FINAL REPORT

OPTN/UNOS Vessels Policy Working Group
Sponsored by *Operations & Safety Committee*

*Extra Vessel Supply & Demand Analysis:
Assessing the Likelihood of a Vessel Shortage for Recipients of Seropositive
Transplants, Assuming Storage of Seropositive Vessels is Prohibited*

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Vessels Policy Working Group
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Background/Purpose

This working group is drafting proposed policy changes to address concerns with transmission of diseases such as hepatitis C and hepatitis B from stored “extra vessels.” Prohibiting storage of such seropositive vessels would reduce or eliminate the risk of transmission, but potentially at the cost of not having enough vessels available for emergency revascularization procedures, in particular for recipients of an HCV+ or HBVs Ag+ organ. The working group is focused on improving patient safety, in light of an HCV disease transmission from an extra vessel in 2009. The group is also concerned with the potential impact on vessel availability for patients receiving organ transplants from seropositive donors (e.g., HCV+ recipient receiving HCV+ liver), and the impact on organ availability if centers choose to no longer accept such organs.

Committee Work Plan Item(s) Addressed

Develop appropriate policy modifications to prevent disease transmission in the area of vessel recovery, storage, and transplant.

Committee Request

Under this proposal, would enough seronegative vessels be available to meet the potential need for recipients of seropositive organs?

- (Potential Vessel *Demand*) Tabulate the number of recipients of HCV+ (or HBVs Ag+) donor organs, by transplanted organ and encrypted center ID. Each such recipient has a chance of requiring a vessel for vasculature revision. Currently, vessels associated with these transplanted organs can be stored for this patient; however, a proposal to prohibit storage of such seropositive vessels would necessitate using a stored vessel from a different (non-seropositive) donor in the event of vascular thrombosis.
- (Vessel *Supply*) For each recipient of an HCV+ (or HBVs Ag+) donor organ, determine the number of non-prohibited vessels of the same blood type that were “potentially available” (sent to the center from a donor recovered less than 14 days ago) during the 14-day post-transplant window.
 - Exclude vessels from HCV+ (or HBs Ag+) donors, since the proposal would prohibit their storage.
 - Exclude vessels used for other transplant recipients, as available data permits. (This assumes that all instances where stored vessels were used for transplantation were reported. Could assess the sensitivity to this assumption by removing an additional, random percentage of vessels that may have been used but not reported.)
 - Could consider broadening the definition of an “available vessel” to include those sent to that center “or nearby centers.”
 - Assess disparity among centers in availability of vessels for these HCV+ recipients.

Executive Summary

Under a policy that prohibits the storage of seropositive vessels, this analysis shows that many DSAs have a high estimated probability (>0.25) of experiencing a “potential vessel shortage” within a year (**Table 6**), even if transplant centers within the same Donor Service Area (DSA) share vessels. A “potential shortage” is defined as having no ABO-compatible vessels available within the DSA for a recipient of a seropositive organ transplant, within 14 days of the transplant. Approximately 10 DSA’s are likely to experience a potential shortage in a one-year period of time.

However, a potential shortage itself is not an actual shortage, but would only become one if the recipient requires vascular revision and no ABO-compatible donor vessels are available (regardless of the availability of synthetic vessel substitutes). Conservatively assuming the probability of needing stored vessels for post-transplant (within 14 days) vascular reconstruction is 10%, only 1 or 2 DSAs are likely to experience an actual shortage within one year (see **Sensitivity Analysis Results**). Both the estimated potential and actual shortage probabilities vary substantially across DSAs.

Data

The analysis is based on OPTN data as of July 16, 2010. It includes extra vessels reported by OPO’s as being sent along with organs recovered for transplant between September 1, 2008 and December 31, 2009. Prior to September 1, 2008, the system did not require the OPO to enter the transplant center to which the vessels were sent, leading to missing “sent-to” centers for about 3% of extra vessels. Electronic reporting of vessel disposition, both by the OPO and transplant center, was introduced into UNet on April 29, 2006.

The analysis also includes transplants that occurred between September 1, 2008 and December 31, 2009.

Methods, Assumptions, and Results

The goal of the analysis is to compare the number of transplants using seropositive (HCV+ or HBs Ag+) organs in each transplant center (or DSA), and compare it to the number of unused extra vessels sent to that transplant center (or DSA) around the same time as the transplants occurred. If storage of seropositive vessels is no longer permitted, recipients of seropositive organs would need to rely on other available vessels if vascular revision should be required. Since policy only allows vessels to be stored for at most 14 days, seronegative vessels received within +/-14 days of a transplant would be considered potential replacements for the prohibited seropositive vessels.

This analysis could either evaluate vessels supply and demand dynamics for individual transplant centers or for all the transplant centers within each DSA. A working group member has suggested that extra vessels could be shared among centers within a DSA, this analysis is DSA-based and assumes centers will share vessels within the DSA to meet needs as they arise. A transplant-center based analysis would result in even higher potential shortage probabilities due to a lack of this assumed sharing.

Table 0 reveals that the vast majority of OPOs report that an extra vessel was sent along with the liver most of the time. The OPOs are sorted in descending order of vessel donor rate. Specifically, 51 OPOs report that vessels were sent with between 80% and 100% of liver donors. (The number of ‘liver donors’ includes donors in which the liver was recovered for transplant but not actually transplanted.) Six OPOs have moderately lower rates of reporting vessels sent with the liver, ranging from about 50% to 75%. One OPO (24582E) clearly stands out as not reporting sent vessels nearly as frequently as the others, with a rate of only 17.0%. Overall, 83% of donors for which the liver was recovered for the purpose of transplantation had vessels reported sent with the liver. This suggests that data on vessel supply – with the exception of a handful of OPO’s – is largely complete.

Table 1 shows the total number of vessels reported sent to the transplant centers in each DSA between September 1, 2008 and December 31, 2009, by serostatus. The seronegative vessels, for which storage will continue to be permitted, are broken down by disposition – transplanted, destroyed, or unknown. The number of transplants occurring within the DSA between September 1, 2008 and December 31, 2009 is also shown, by donor serostatus and organ group. The data are sorted by (descending) number of seropositive Liver, Pancreas, KP, or Intestine transplants, which are considered to represent the potential demand for vessels whose storage may become prohibited.

Note the similarity in **Table 1** for most DSA’s between the number of extra vessels sent and the number of Liver, Pancreas, KP, or Intestine transplants in each DSA; this suggests that nearly all of the vessels are sent for Liver, Pancreas, KP or Intestine recipients, not for recipients of thoracic organs or kidneys. This suggestion is confirmed by a previous vessel analysis, which revealed that the vast majority of extra vessels were sent with livers, and by **Table 0**, which shows that liver vessels are sent with the vast majority of liver donors. Note that the few vessel-receiving DSA’s that stand out in **Table 1** as having noticeably fewer vessels received than LI/PA/KP/IN transplants performed (16218E, 25755E, 24582E) are managed by OPO’s that stand-out as outliers in **Table 0**.

To quantify the probability of a potential shortage – defined as having no available vessels on hand within 14 days of transplanting a seropositive organ, regardless of whether the recipient actually needs the vessel – the analysis tabulates the number of “available” vessels sent to each DSA for each two-week period between September 1, 2008 and December 31, 2009. The same was done for transplants using organs from seropositive donors performed within each DSA. **Table 2** shows these biweekly statistics (mean, min, max, and standard deviation) for destroyed vessels and seropositive Liver, Pancreas, KP, and Intestine transplants.

All vessels reported as “destroyed” are assumed to have been discarded because the need for their use did not arise within the refrigeration/shelf-life of each the vessel, not because they were inherently unusable from the moment of receipt for some reason. Thus, all seronegative vessels reported as “destroyed” were considered as part of the “available” vessel supply that could be used for a seropositive organ recipient if the need arises. All transplanted vessels are assumed to be unavailable for use in these seropositive recipients, since, of course, they are being used to meet the demand in other recipients.

Many vessels with unknown disposition were also most likely destroyed since they weren't needed, but the transplant program has not yet reported the destruction to UNOS via the vessel destruction/usage fax form. Of the vessels with known status, about 70% were destroyed. Hence, this analysis assumes that 70% of unknown vessels were also destroyed and thus part of the "available" vessel supply. This proportion is likely biased; the percentage of vessels among the unknowns that were actually destroyed may be different from 70%. However, to avoid the anti-conservative assumption of assuming that all unknown vessels were destroyed and thus available, or the perhaps grossly over-conservative assumption that none of the unknowns were available, 70% was assumed. The general conclusions of this analysis appear to be fairly insensitive to this particular assumption.

Table 3 shows the same information as **Table 2**, except 70% of the vessels with unknown status are included in the vessel supply statistics.

All recipients of seronegative organs that may need vessels are assumed to be covered by the vessels reported as transplanted and the 30% of vessels with unknown status; this assumption is based on lack of evidence of vessel shortages occurring under the current policy, and the proposed policy change only applies to recipients of seropositive organs. Thus, the vessel demand evaluated in this analysis is strictly for transplant recipients of seropositive Livers, Pancreata, KP's, or Intestines.

As implied above, this analysis assumes that only Liver, PA, KP, or IN transplant recipients could potentially require vessels. A previous vessels analysis showed that 92% of reported vessel usage occurs for recipients of those four organ types. But there is some vessel usage among kidney and thoracic recipients, as well. However, the data (**Table 1**, and a previous vessels analysis) suggests that extra vessels are very rarely sent along with the kidney, heart, or lungs, so restricting the supply of seropositive vessels may not have much impact on kidney and thoracic patients.

To calculate the probability of a potential shortage in a DSA for any two-week period, the number of available vessels sent to each DSA was assumed to follow a Poisson distribution with mean equal to average shown in **Table 3**. A similar assumption was made for the number of seropositive transplants, using the transplants average in **Table 3** as the Poisson mean. A potential shortage was defined as having less vessels available in the DSA than the number of seropositive transplants in a two-week time period. For example, if two Liver transplants from HCV+ donors took place within a two-week period in DSA ABCD, but only one available vessel was sent to the DSA during that time, a potential shortage would have occurred.

Table 4 shows the biweekly averages for three possible assumptions for the number of available vessels per week: destroyed only, destroyed + 70% of unknowns, and destroyed + 100% of unknowns. As mentioned previously, for this analysis, the "destroyed + 70% of unknowns" averages were used for the probability calculations. The first DSA shown, 16218E, has a mean of 7.0 available vessels received for each 2-week period, and on average 0.9 seropositive LI/KP/PA/IN transplants. The (Poisson) probability of having zero vessels available in a given 2-week period is only about 0.001. The (Poisson) probability of having one or more such transplants in a given 2-week period is estimated to be about 0.58.

This is the primary way a potential shortage can happen – one or more seropositive transplants, and zero available vessels. But potential shortages can also occur in many other ways, for example when one vessel is available but two seropositive transplants occur within a 2-week period. In general, when the difference between the supply (available vessels) and the demand (seropositive transplants) falls below zero, there is a potential shortage. This difference between Poisson random variables follows a so-called “Skellum” distribution, from which the probability of a potential shortage in a given two-week period is calculated and displayed in **Table 4**. (These probabilities were also confirmed using basic Poisson calculations and statistical first principles.) For DSA 16218E, the probability of a potential shortage in a two-week time period is shown to be approximately 0.003, or 0.3%.

Every two-week time period presents a new opportunity for a potential shortage to manifest. The estimated two-week potential shortage probability was used to calculate the probability of the DSA experiencing a potential shortage in one or more of the 26 biweekly periods within a year. This annual probability appears as the last column in **Table 4**. For DSA 16218E, which had the greatest number of seropositive transplants, it is estimated that there’s only a 7% chance of a potential shortage within a year. Several other DSA’s have higher per-year potential shortage probabilities, in the range of 0.20 to 0.40.

However, the probabilities shown in **Table 4** assume that all available vessels are ABO-compatible with all potential recipients. This, of course, is an unrealistic assumption. Accounting for the fact that many available vessels will not be compatible with some seropositive transplant recipients will increase the likelihood of potential shortages. **Table 5** shows this to be the case, with both biweekly and one-year potential shortage probabilities dramatically increasing when accounting for ABO incompatibility.

To incorporate ABO incompatibility into the analysis, both vessel donors and seropositive transplant recipients were assumed to have the following ABO distribution: A (37%), B (11%), AB (2%), O (50%). These estimates were derived from the data used in this analysis, and were quite similar for both vessel donors and seropositive recipients. These estimates were assumed constant for all DSA’s. There is, of course, some variation in ABO distribution from DSA to DSA; however, the differences did not appear large enough to materially affect the results. Also, subtype-compatibility (e.g., A₂ into O or B) was not considered; in other words, A and AB subtypes were grouped with the primary type.

Table 6 shows the same probabilities as **Table 5**, but sorted in descending order by the estimated one-year potential shortage probability, accounting for ABO incompatibility. This table reveals four DSA’s with one-year potential shortage probabilities exceeding 50%, and many others with probabilities between 20% and 40%. Some DSA’s, on the other hand, have low estimated potential shortage probabilities, driven by a relatively large number of vessels received compared to seropositive transplants.

With so many DSA’s having a high probability of a potential shortage within one-year, the analysis shows it is quite likely that a policy prohibiting storage of seropositive vessels will result in potential shortages. Based on these estimated potential shortage probabilities, we would

expect approximately 10 DSA's to experience a potential shortage in a one-year period of time. The variation in potential shortage probabilities across DSAs suggests that if storage of seropositive vessels is prohibited, it may be more sensible for transplant centers in some DSA's (with low potential shortage probability) to continue to using seropositive organs, compared with other DSAs (with high potential shortage probability) which may have concern about vessel availability for their recipients.

However, it must be remembered that the definition of "potential shortage" in this analysis does not adjust for the fact that not all seropositive organ recipients will need vessels. Since only a fraction of such recipients will actually develop vascular problems, the probabilities of "actual shortages" – as defined by truly needing a vessel but one not being available – are actually lower than those shown in the tables.

By incorporating a conservative estimate of 10% for the probability of actually needing stored vessels within 14 days post transplant, **Table 8** shows that the actual shortage probabilities are substantially lower than the potential shortage probabilities, as anticipated. Only three DSA's have actual shortage probabilities exceeding 10%. A sensitivity analysis, described in detail below and also displayed in **Table 8**, shows that under varying assumptions no DSA had an actual shortage probability exceeding 20%.

Some DSAs did not have any seropositive organ transplants during 9/1/2008 - 12/31/09. The probability of potential shortage was set to missing for these DSAs, though it is possible that such transplants may occur in the future. Thus, the probabilities would be nonzero. Three DSAs (25449E, 07344E, and 02805E) were not included since they have no active liver, pancreas, or intestine programs and thus no seropositive LI/PA/KP/IN transplants nor vessels received. There were no DSAs that had seropositive organ transplants but zero vessels.

Sensitivity Analysis

Given the uncertainties associated with vessels being reported as sent, transplanted, and/or destroyed, determining how sensitive the overall conclusion – that potential shortages are very likely to occur – is to key assumptions is important. The three assumptions considered most significant are as follows: (1) vessels reported sent by OPOs to transplant centers (used to estimate vessel supply), (2) vessel disposition reporting - destroyed/transplanted/unknown (used to estimate vessels available to meet demand), and (3) level of vessel of sharing (within DSA, or transplant center level only).

A fourth important assumption/input – the chances of a LI/KP/PA/IN recipient requiring use of stored vessels within 14 days – is required to convert potential shortage probabilities to actual shortage probabilities. However, due to lack of data available to estimate the likelihood of vascular thrombosis occurring within 14 days of transplant, this analysis is limited to estimating the chances of a "potential shortage." It might be possible to use expert opinion to determine a reasonable estimate for the chance of needing a stored vessel within 14 days and augment the analysis to help determine whether actual shortages would be likely.

The baseline scenario represents the assumptions described in the previous sections of this document. Specifically, the vessel supply was assumed to be represented by the number of vessels reported sent; the available vessels were assumed to be those that were destroyed plus 70% of the unknowns; transplant centers were assumed to be able to share vessels readily with other centers in the same DSA.

Five additional scenarios were evaluated and are shown in the embedded table below as well as in **Table 7**. In Scenario 1, the percentage of unknowns available for transplant was changed from 70% to 50%. For this to be true, half of the vessels with unknown disposition would have to have been transplanted. Not surprisingly, by decreasing the available supply of vessels in this way, Scenario 1 results in higher potential shortage probabilities, and an increase from 10 to 13 DSAs likely to experience a potential shortage within one year. Though it may be the case that more than 50% of the unknowns are transplanted and thus unavailable, further decreasing the available vessel supply will only result in higher potential shortage probabilities and the same overall conclusion, that potential shortages are likely.

Sensitivity Analysis Results

Scenario	Vessel Supply Assumptions			Analysis Results	Vessel Demand Assumption	Analysis Results
	# Vessels Sent	# Vessels Available	Vessel Sharing	# of DSA's likely to experience a "potential shortage" within 1 year	LI/PA/KP/IN recipient needing stored vessels within 14 days of transplant	# of DSA's likely to experience an "actual shortage" within 1 year
Baseline	As Reported	All Reported Destroyed + 70% of Unknowns	Within DSA	10	0.10	1
1	As Reported	All Reported Destroyed + 50% of Unknowns	Within DSA	13	0.10	2
2	As Reported	All Reported Destroyed + 95% of Unknowns	Within DSA	8	0.10	1
3	Boost 7 DSA's where local OPO is outlier	All Reported Destroyed + 70% of Unknowns	Within DSA	9	0.10	1
4	Boost 7 outlier DSA's + Boost all DSA's by 20% (100%/83%)	All Reported Destroyed + 70% of Unknowns	Within DSA	7	0.10	1
5	Boost 7 outlier DSA's + Boost all DSA's by 20% (100%/83%)	All Reported Destroyed + 95% of Unknowns	Within DSA	5	0.10	0.5

Scenario 2 evaluates the impact of assuming that the vast majority (95%) of vessels with unknown disposition are actually destroyed and thus are available for use in recipients of seropositive organs. As expected, the potential shortage probabilities decrease, but the number of DSA's likely to experience a potential vessel shortage is still approximately 8.

Table 0 reveals that most OPOs are reporting that vessels were sent with the vast majority of liver donors. However, one OPO is clearly an outlier, and six others stand out as reporting noticeably lower than the others. For this extreme outlier (24582E), there are many reports from transplant centers in their DSA of having used extra vessels from donors procured by OPO 24582E. So clearly this OPO is not reporting all of the extra vessels that they send. To adjust the analysis for this underreporting, Scenario 3 boosts the number of vessels sent to these seven DSAs – assuming that most of the vessels in a DSA are sent by their local OPO – by multiplying the available vessels in the DSA by this ratio: the national average rate of reporting “liver vessels were sent,” divided by their OPO’s rate. For example, DSA 16218E’s biweekly available vessels (destroyed + 80% of unknowns) of 7.0 (**Table 4**) was increased by multiplying by 1.63 = 83%/51%, from **Table 0**. Only the results for these seven DSAs change in Scenario 3, resulting in one less anticipated DSA with a potential shortage, 9, relative to the baseline scenario, 10.

Since it is conceivable that other OPOs, not just the seven outliers, are underreporting to some degree, Scenario 4 evaluates the assumption that the actual number of available vessels is 20% higher for all DSAs. This roughly assumes that vessels are actually sent with 100% of liver donors, not just 83%. ($100\%/83\% = 1.20$) This scenario could also be considered reflective of a potential behavior change in which OPOs would intentionally recover even more vessels due to a policy restricting storage of seropositive ones. The potential shortages probabilities decrease in Scenario 4, as expected, but not by much.

Finally, Scenario 5 combines the most liberal assumptions in terms of both vessel supply assumptions, by boosting all DSAs in terms of vessels received, and assuming all destroyed plus 95% of unknown vessels are available. Even so, potential shortage probabilities are still fairly high, and approximately five DSAs would still be likely to experience a potential shortage within a year.

The Vessels Working Group estimated the probability of requiring stored vessels for vascular revision post-transplant (within 14 days) to be only about 1% to 5%, with a conservative upper bound of 10%. By incorporating this 10% estimate into the analysis, the number of DSA’s likely to experience an “actual” vessel shortage drops to between 0.5 and 2, depending on the scenario, as shown in the Sensitivity Analysis table above.

**Table 0: Rates of OPOs Reporting Vessels were Sent
01SEP2008 - 31DEC2009
Sorted by (Descending) Rate of Reporting Vessels Sent with Liver Donor
(‘Donor’ Means Organ Recovered for Purpose of Transplantation)**

OPO of Recovery	# Donors	# Liver Donors	Liver Donors w Vessels Reported Sent (w Liver)	% Liver Donors w Vessels Reported Sent (w Liver)	Total # Organs with which Vessels were Reported Sent	Avg # Organs w Vessels Sent, per Vessel Donor	% Vessel Donors w Vessels Reported Sent w Mult Organs
20604E	202	192	186	96.9%	187	1.30	26.2%
20655E	106	84	81	96.4%	81	1.07	7.4%
01020E	332	302	287	95.0%	287	1.17	16.4%
29223E	230	196	186	94.9%	188	1.22	20.7%
00918E	174	153	145	94.8%	146	1.39	29.5%
02142E	158	136	128	94.1%	131	1.22	20.6%
07344E	64	51	48	94.1%	49	1.10	10.2%
07293E	137	118	111	94.1%	111	1.06	3.6%
17748E	138	121	113	93.4%	114	1.12	10.5%
19584E	98	89	83	93.3%	83	1.25	20.5%
06783E	183	175	163	93.1%	163	1.17	16.6%
31161E	219	195	181	92.8%	186	1.29	26.9%
06987E	351	301	279	92.7%	282	1.25	22.7%
29580E	57	54	50	92.6%	50	1.36	28.0%
06885E	117	94	87	92.6%	87	1.11	11.5%
30345E	124	120	111	92.5%	111	1.07	6.3%
27234E	67	50	46	92.0%	46	1.33	21.7%
10608E	220	187	172	92.0%	172	1.17	15.7%
13056E	67	61	56	91.8%	58	1.21	20.7%
13821E	384	277	254	91.7%	256	1.22	20.3%
04590E	152	141	129	91.5%	131	1.23	20.6%
15963E	160	132	120	90.9%	121	1.26	24.8%
33915E	139	112	101	90.2%	102	1.28	24.5%
02805E	64	55	49	89.1%	49	1.29	24.5%
24021E	257	219	195	89.0%	197	1.29	23.4%
38097E	321	270	240	88.9%	248	1.39	24.2%
37434E	39	35	31	88.6%	32	1.53	53.1%
22848E	284	218	193	88.5%	196	1.27	23.0%

Based on OPTN data as of July 30, 2010

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25296E	64	52	46	88.5%	46	1.04	4.3%
25449E	100	86	76	88.4%	76	1.25	25.0%
33405E	121	100	88	88.0%	90	1.22	22.2%
15708E	296	260	228	87.7%	229	1.10	9.2%
19890E	98	88	77	87.5%	77	1.35	35.1%
04437E	56	46	40	87.0%	40	1.23	22.5%
11016E	386	285	247	86.7%	251	1.29	23.1%
15402E	57	52	45	86.5%	45	1.13	13.3%
11373E	153	136	117	86.0%	119	1.26	23.5%
38658E	168	148	127	85.8%	127	1.18	10.2%
36312E	87	84	72	85.7%	72	1.07	5.6%
27693E	304	286	245	85.7%	245	1.20	18.8%
15198E	193	169	144	85.2%	144	1.49	36.1%
27285E	95	87	74	85.1%	75	1.27	22.7%
31467E	290	244	207	84.8%	209	1.14	11.5%
36669E	240	180	151	83.9%	151	1.02	2.0%
05610E	187	142	117	82.4%	153	2.12	61.4%
22695E	195	165	135	81.8%	139	1.21	17.3%
10965E	130	103	84	81.6%	84	1.25	23.8%
18615E	120	100	81	81.0%	82	1.43	40.2%
28968E	161	131	106	80.9%	111	1.30	27.9%
17901E	168	139	112	80.6%	114	1.32	31.6%
16269E	71	61	49	80.3%	49	1.12	6.1%
19737E	578	479	355	74.1%	357	1.15	13.2%
25755E	519	390	270	69.2%	274	1.06	4.0%
27183E	60	48	31	64.6%	31	1.16	12.9%
24378E	160	146	85	58.2%	87	1.11	10.3%
08262E	36	27	14	51.9%	15	1.33	33.3%

Based on OPTN data as of July 30, 2010

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16218E	361	324	165	50.9%	170	1.10	8.2%
24582E	372	283	48	17.0%	51	1.12	7.8%

TABLE 1: Vessels Reported Sent to Each DSA, by Vessel Disposition, and Transplants Occurring in Each DSA, by Organ Donor Serostatus 01SEP2008 - 31DEC2009 (34 bi-weekly periods)
Sorted by (Descending) Number of Seropositive LI/KP/PA/IN Transplants

DSA	Vessels Reported Sent (Vessel Supply)						Transplants (Potential Vessel Demand)			
	By Serostatus			Disposition of Sero- Vessels			Recip of Sero- Organ		Recip of Sero+ Organ	
	Total	Sero+	Sero-	Txed	Destroyed	Unknown	Liver, PA, KP, or IN	KI or Thor	Liver, PA, KP, or IN	KI or Thor
16218E	372	31	341	39	93	209	542	1521	30	55
19737E	394	26	368	23	179	166	382	1182	22	39
04590E	319	14	305	41	67	197	309	562	14	6
31467E	366	19	347	75	101	171	380	714	14	8
11016E	285	11	274	25	0	249	280	921	12	18
02142E	267	11	256	69	146	41	254	543	12	23
15963E	183	9	174	33	39	102	202	581	9	3
20604E	260	8	252	26	40	186	256	376	9	13
13821E	286	8	278	13	99	166	302	929	9	11
25755E	372	8	364	56	204	104	506	1485	8	13
10608E	212	8	204	23	47	134	206	505	8	2
24582E	124	5	119	19	46	54	425	1181	7	9
15198E	261	6	255	140	1	114	280	444	7	4
27693E	144	6	138	17	0	121	140	492	7	4
01020E	307	6	301	19	47	235	299	580	6	15
22848E	308	5	303	29	53	221	352	1018	6	36
29580E	208	5	203	34	153	16	221	189	5	1
06987E	412	3	409	31	212	166	427	1027	4	9
30345E	119	4	115	13	63	39	123	540	4	11
38097E	315	4	311	35	187	89	280	699	4	6
19584E	174	3	171	17	147	7	173	168	3	4
10965E	90	2	88	6	32	50	94	350	2	3
00918E	301	2	299	80	186	33	295	374	2	7
29223E	160	2	158	43	111	4	155	441	2	1
07293E	107	2	105	0	34	71	113	257	2	1
24378E	123	2	121	0	10	111	177	709	2	35

Based on OPTN data as of July 30, 2010

TABLE 1: Vessels Reported Sent to Each DSA, by Vessel Disposition, and Transplants Occurring in Each DSA, by Organ Donor Serostatus 01SEP2008 - 31DEC2009 (34 bi-weekly periods)
Sorted by (Descending) Number of Seropositive LI/KP/PA/IN Transplants

DSA	Vessels Reported Sent (Vessel Supply)						Transplants (Potential Vessel Demand)			
	By Serostatus			Disposition of Sero- Vessels			Recip of Sero- Organ		Recip of Sero+ Organ	
	Total	Sero+	Sero-	Txed	Destroyed	Unknown	Liver, PA, KP, or IN	KI or Thor	Liver, PA, KP, or IN	KI or Thor
37434E	114	3	111	26	16	69	116	169	2	3
08976E	87	2	85	19	0	66	85	218	2	5
36312E	43	1	42	1	16	25	43	183	1	2
11373E	143	1	142	28	104	10	160	388	1	3
15402E	25	1	24	0	21	3	23	135	1	0
31161E	303	1	302	38	101	163	342	821	1	4
15708E	131	1	130	5	3	122	153	451	1	3
24021E	186	3	183	7	25	151	174	718	1	12
25296E	66	1	65	4	38	23	68	144	1	6
20655E	66	2	64	8	36	20	61	221	1	6
06885E	94	1	93	8	14	71	102	256	1	6
22695E	196	1	195	29	49	117	223	516	1	25
38658E	173	0	173	4	164	5	169	403	0	7
27234E	14	0	14	3	0	11	11	186	0	12
17901E	159	1	158	41	12	105	197	464	0	22
33915E	75	0	75	11	0	64	85	201	0	4
08262E	11	0	11	1	1	9	19	52	0	1
13056E	52	0	52	3	0	49	59	199	0	1
19890E	96	0	96	12	13	71	100	205	0	1
36669E	87	0	87	1	32	54	112	639	0	25
16269E	2	0	2	0	0	2	0	129	0	1
04437E	12	0	12	5	0	7	13	103	0	0
27183E	3	0	3	0	0	3	3	136	0	3
18615E	52	0	52	28	10	14	53	272	0	1
33405E	82	0	82	2	0	80	83	325	0	1
17748E	9	0	9	0	0	9	9	117	0	0

Based on OPTN data as of July 30, 2010

**TABLE 1: Vessels Reported Sent to Each DSA, by Vessel Disposition,
and Transplants Occurring in Each DSA, by Organ Donor Serostatus
01SEP2008 - 31DEC2009 (34 bi-weekly periods)
Sorted by (Descending) Number of Seropositive LI/KP/PA/IN Transplants**

DSA	Vessels Reported Sent (Vessel Supply)						Transplants (Potential Vessel Demand)			
	By Serostatus			Disposition of Sero- Vessels			Recip of Sero- Organ		Recip of Sero+ Organ	
	Total	Sero+	Sero-	Txed	Destroyed	Unknown	Liver, PA, KP, or IN	KI or Thor	Liver, PA, KP, or IN	KI or Thor
06783E	115	0	115	0	0	115	122	237	0	9
28968E	142	0	142	13	60	69	146	530	0	5
05610E	282	0	282	91	135	56	187	421	0	1
All	9289	229	9060	1294	3147	4619	10091	26627	224	506

**TABLE 2: Vessels Received in Each DSA but Destroyed,
and Seropositive Organ Transplants Occurring in Each DSA
01SEP2008 - 31DEC2009 (34 bi-weekly periods)
Biweekly Statistics for the 34 Two-Week Periods
Sorted by (Descending) Number of Seropositive LI/KP/PA/IN Transplants**

DSA	Vessels Reported Sent & Destroyed (Vessel Supply)					Seropositive LI, KP, PA, or IN Transplants (Potential Vessel Demand where Supply May be Restricted)				
	# Vessels	Avg	Min	Max	Std	# Transplants	Avg	Min	Max	Std
16218E	93	2.7	0	11	3.2	30	0.9	0	3	0.9
19737E	179	5.3	1	11	2.6	22	0.6	0	3	0.9
04590E	67	2.0	0	6	1.6	14	0.4	0	4	0.8
31467E	101	3.0	0	13	2.4	14	0.4	0	2	0.7
11016E	0	0.0	0	0	0.0	12	0.3	0	3	0.7
02142E	146	4.3	0	9	2.1	12	0.3	0	2	0.5
15963E	39	1.1	0	4	1.1	9	0.3	0	1	0.4
20604E	40	1.2	0	6	2.0	9	0.3	0	1	0.4
13821E	99	2.9	0	6	1.7	9	0.3	0	1	0.4
25755E	204	6.0	1	12	2.3	8	0.2	0	3	0.6
10608E	47	1.4	0	4	1.0	8	0.2	0	1	0.4
24582E	46	1.4	0	5	1.3	7	0.2	0	2	0.5
15198E	1	0.0	0	1	0.2	7	0.2	0	2	0.5
27693E	0	0.0	0	0	0.0	7	0.2	0	2	0.5
01020E	47	1.4	0	4	1.3	6	0.2	0	1	0.4
22848E	53	1.6	0	6	1.6	6	0.2	0	2	0.5
29580E	153	4.5	0	12	2.5	5	0.1	0	1	0.4
06987E	212	6.2	0	11	2.9	4	0.1	0	1	0.3
30345E	63	1.9	0	5	1.2	4	0.1	0	1	0.3
38097E	187	5.5	1	13	2.5	4	0.1	0	2	0.4
19584E	147	4.3	1	9	2.1	3	0.1	0	2	0.4
10965E	32	0.9	0	4	0.9	2	0.1	0	1	0.2
00918E	186	5.5	1	12	2.5	2	0.1	0	1	0.2
29223E	111	3.3	0	7	1.7	2	0.1	0	1	0.2
07293E	34	1.0	0	3	1.0	2	0.1	0	1	0.2
24378E	10	0.3	0	4	0.8	2	0.1	0	1	0.2
37434E	16	0.5	0	3	0.8	2	0.1	0	1	0.2

Based on OPTN data as of July 30, 2010

**TABLE 2: Vessels Received in Each DSA but Destroyed,
and Seropositive Organ Transplants Occurring in Each DSA
01SEP2008 - 31DEC2009 (34 bi-weekly periods)
Biweekly Statistics for the 34 Two-Week Periods
Sorted by (Descending) Number of Seropositive LI/KP/PA/IN Transplants**

DSA	Vessels Reported Sent & Destroyed (Vessel Supply)					Seropositive LI, KP, PA, or IN Transplants (Potential Vessel Demand where Supply May be Restricted)				
	# Vessels	Avg	Min	Max	Std	# Transplants	Avg	Min	Max	Std
08976E	0	0.0	0	0	0.0	2	0.1	0	2	0.3
36312E	16	0.5	0	2	0.7	1	0.0	0	1	0.2
11373E	104	3.1	0	6	1.3	1	0.0	0	1	0.2
15402E	21	0.6	0	4	0.8	1	0.0	0	1	0.2
31161E	101	3.0	0	13	3.5	1	0.0	0	1	0.2
15708E	3	0.1	0	1	0.3	1	0.0	0	1	0.2
24021E	25	0.7	0	5	1.5	1	0.0	0	1	0.2
25296E	38	1.1	0	6	1.6	1	0.0	0	1	0.2
20655E	36	1.1	0	4	1.1	1	0.0	0	1	0.2
06885E	14	0.4	0	3	0.8	1	0.0	0	1	0.2
22695E	49	1.4	0	5	1.4	1	0.0	0	1	0.2
38658E	164	4.8	0	9	2.1	0	0.0	0	0	0.0
27234E	0	0.0	0	0	0.0	0	0.0	0	0	0.0
17901E	12	0.4	0	5	1.1	0	0.0	0	0	0.0
33915E	0	0.0	0	0	0.0	0	0.0	0	0	0.0
08262E	1	0.0	0	1	0.2	0	0.0	0	0	0.0
13056E	0	0.0	0	0	0.0	0	0.0	0	0	0.0
19890E	13	0.4	0	4	1.1	0	0.0	0	0	0.0
36669E	32	0.9	0	7	1.6	0	0.0	0	0	0.0
16269E	0	0.0	0	0	0.0	0	0.0	0	0	0.0
04437E	0	0.0	0	0	0.0	0	.	.	.	.
27183E	0	0.0	0	0	0.0	0	0.0	0	0	0.0
18615E	10	0.3	0	3	0.6	0	0.0	0	0	0.0
33405E	0	0.0	0	0	0.0	0	0.0	0	0	0.0
17748E	0	0.0	0	0	0.0	0	.	.	.	.
06783E	0	0.0	0	0	0.0	0	0.0	0	0	0.0
28968E	60	1.8	0	5	1.8	0	0.0	0	0	0.0

Based on OPTN data as of July 30, 2010

**TABLE 2: Vessels Received in Each DSA but Destroyed,
and Seropositive Organ Transplants Occurring in Each DSA
01SEP2008 - 31DEC2009 (34 bi-weekly periods)
Biweekly Statistics for the 34 Two-Week Periods
Sorted by (Descending) Number of Seropositive LI/KP/PA/IN Transplants**

DSA	Vessels Reported Sent & Destroyed (Vessel Supply)					Seropositive LI, KP, PA, or IN Transplants (Potential Vessel Demand where Supply May be Restricted)				
	# Vessels	Avg	Min	Max	Std	# Transplants	Avg	Min	Max	Std
05610E	135	4.0	0	23	5.0	0	0.0	0	0	0.0
All	3147					224				

**TABLE 3: Vessels Reported Sent to Each DSA but Destroyed or Disposition Unknown,
and Seropositive Organ Transplants Occurring in Each DSA
01SEP2008 - 31DEC2009 (34 bi-weekly periods)
Biweekly Statistics for the 34 Two-Week Periods
Sorted by (Descending) Number of Seropositive LI/KP/PA/IN Transplants**

DSA	Vessels Reported Sent & Destroyed or Unknown (Vessel Supply)					Seropositive LI, KP, PA, or IN Transplants (Potential Vessel Demand where Supply May be Restricted)				
	# Vessels	Avg	Min	Max	Std	# Transplants	Avg	Min	Max	Std
16218E	302	8.9	2	18	4.0	30	0.9	0	3	0.9
19737E	345	10.1	5	20	3.4	22	0.6	0	3	0.9
04590E	264	7.8	2	15	3.2	14	0.4	0	4	0.8
31467E	272	8.0	3	16	3.0	14	0.4	0	2	0.7
11016E	249	7.3	2	13	2.4	12	0.3	0	3	0.7
02142E	187	5.5	1	11	2.3	12	0.3	0	2	0.5
15963E	141	4.1	1	10	2.1	9	0.3	0	1	0.4
20604E	226	6.6	3	13	2.3	9	0.3	0	1	0.4
13821E	265	7.8	1	15	3.3	9	0.3	0	1	0.4
25755E	308	9.1	1	15	2.9	8	0.2	0	3	0.6
10608E	181	5.3	2	11	2.5	8	0.2	0	1	0.4
24582E	100	2.9	1	8	1.7	7	0.2	0	2	0.5
15198E	115	3.4	0	8	1.9	7	0.2	0	2	0.5
27693E	121	3.6	1	8	1.8	7	0.2	0	2	0.5
01020E	282	8.3	1	13	2.9	6	0.2	0	1	0.4
22848E	274	8.1	3	19	3.6	6	0.2	0	2	0.5
29580E	169	5.0	0	12	2.4	5	0.1	0	1	0.4
06987E	378	11.1	3	17	3.4	4	0.1	0	1	0.3
30345E	102	3.0	0	7	1.7	4	0.1	0	1	0.3
38097E	276	8.1	1	16	3.4	4	0.1	0	2	0.4
19584E	154	4.5	1	9	2.1	3	0.1	0	2	0.4
10965E	82	2.4	0	6	1.7	2	0.1	0	1	0.2
00918E	219	6.4	1	13	2.7	2	0.1	0	1	0.2
29223E	115	3.4	0	7	1.6	2	0.1	0	1	0.2
07293E	105	3.1	0	8	1.8	2	0.1	0	1	0.2
24378E	121	3.6	0	9	2.5	2	0.1	0	1	0.2
37434E	85	2.5	0	7	1.8	2	0.1	0	1	0.2

Based on OPTN data as of July 30, 2010

**TABLE 3: Vessels Reported Sent to Each DSA but Destroyed or Disposition Unknown,
and Seropositive Organ Transplants Occurring in Each DSA
01SEP2008 - 31DEC2009 (34 bi-weekly periods)
Biweekly Statistics for the 34 Two-Week Periods
Sorted by (Descending) Number of Seropositive LI/KP/PA/IN Transplants**

DSA	Vessels Reported Sent & Destroyed or Unknown (Vessel Supply)					Seropositive LI, KP, PA, or IN Transplants (Potential Vessel Demand where Supply May be Restricted)				
	# Vessels	Avg	Min	Max	Std	# Transplants	Avg	Min	Max	Std
08976E	66	1.9	0	5	1.3	2	0.1	0	2	0.3
36312E	41	1.2	0	4	1.0	1	0.0	0	1	0.2
11373E	114	3.4	0	6	1.3	1	0.0	0	1	0.2
15402E	24	0.7	0	4	0.9	1	0.0	0	1	0.2
31161E	264	7.8	2	18	3.7	1	0.0	0	1	0.2
15708E	125	3.7	1	7	1.7	1	0.0	0	1	0.2
24021E	176	5.2	0	12	2.6	1	0.0	0	1	0.2
25296E	61	1.8	0	6	1.3	1	0.0	0	1	0.2
20655E	56	1.6	0	5	1.2	1	0.0	0	1	0.2
06885E	85	2.5	0	5	1.3	1	0.0	0	1	0.2
22695E	166	4.9	2	10	2.4	1	0.0	0	1	0.2
38658E	169	5.0	0	9	2.2	0	0.0	0	0	0.0
27234E	11	0.3	0	2	0.6	0	0.0	0	0	0.0
17901E	117	3.4	0	10	2.3	0	0.0	0	0	0.0
33915E	64	1.9	0	6	1.6	0	0.0	0	0	0.0
08262E	10	0.3	0	2	0.5	0	0.0	0	0	0.0
13056E	49	1.4	0	4	1.2	0	0.0	0	0	0.0
19890E	84	2.5	0	6	1.8	0	0.0	0	0	0.0
36669E	86	2.5	0	7	1.7	0	0.0	0	0	0.0
16269E	2	0.1	0	2	0.3	0	0.0	0	0	0.0
04437E	7	0.2	0	2	0.5	0	.	.	.	.
27183E	3	0.1	0	1	0.3	0	0.0	0	0	0.0
18615E	24	0.7	0	3	0.8	0	0.0	0	0	0.0
33405E	80	2.4	0	6	1.6	0	0.0	0	0	0.0
17748E	9	0.3	0	1	0.4	0	.	.	.	.
06783E	115	3.4	0	12	2.4	0	0.0	0	0	0.0
28968E	129	3.8	0	10	2.6	0	0.0	0	0	0.0

Based on OPTN data as of July 30, 2010

**TABLE 3: Vessels Reported Sent to Each DSA but Destroyed or Disposition Unknown,
and Seropositive Organ Transplants Occurring in Each DSA
01SEP2008 - 31DEC2009 (34 bi-weekly periods)
Biweekly Statistics for the 34 Two-Week Periods
Sorted by (Descending) Number of Seropositive LI/KP/PA/IN Transplants**

DSA	Vessels Reported Sent & Destroyed or Unknown (Vessel Supply)					Seropositive LI, KP, PA, or IN Transplants (Potential Vessel Demand where Supply May be Restricted)				
	# Vessels	Avg	Min	Max	Std	# Transplants	Avg	Min	Max	Std
05610E	191	5.6	0	23	4.3	0	0.0	0	0	0.0
All	7766					224				

TABLE 4: Biweekly Vessel & Transplant Statistics, with Probability of Vessel Shortage, by DSA
01SEP2008 - 31DEC2009 (34 bi-weekly periods)
Biweekly Statistics for the 34 Two-Week Periods
Sorted by (Descending) Number of Seropositive LI/KP/PA/IN Transplants

DSA	Biweekly Averages				Probabilities per Biweek*			Per Year*
	Destroyed	Dest + 70% of Unknowns	Destroyed + Unknowns	Sero+ transplants (LI,KP,PA,IN)	P(Zero Vessels)	P(1+ Transplants)	P(Potential Shortage)	P(Potential Shortage)
16218E	2.7	7.0	8.9	0.86	0.000	0.58	0.003	0.07
19737E	5.3	8.7	10.1	0.63	0.000	0.47	0.000	0.01
04590E	2.0	6.0	7.8	0.40	0.001	0.33	0.002	0.05
31467E	3.0	6.5	8.0	0.40	0.000	0.33	0.001	0.03
11016E	0.0	5.1	7.3	0.34	0.002	0.29	0.004	0.09
02142E	4.3	5.1	5.5	0.34	0.002	0.29	0.003	0.09
15963E	1.1	3.2	4.1	0.26	0.020	0.23	0.013	0.28
20604E	1.2	5.0	6.6	0.26	0.002	0.23	0.003	0.07
13821E	2.9	6.3	7.8	0.26	0.001	0.23	0.001	0.02
25755E	6.0	8.1	9.1	0.23	0.000	0.20	0.000	0.00
10608E	1.4	4.1	5.3	0.23	0.007	0.20	0.005	0.12
24582E	1.4	2.5	2.9	0.20	0.000	0.18	0.019	0.40
15198E	0.0	2.4	3.4	0.20	0.058	0.18	0.021	0.42
27693E	0.0	2.5	3.6	0.20	0.050	0.18	0.019	0.39
01020E	1.4	6.2	8.3	0.17	0.001	0.16	0.001	0.01
22848E	1.6	6.1	8.1	0.17	0.001	0.16	0.001	0.01
29580E	4.5	4.8	5.0	0.14	0.003	0.13	0.001	0.04
06987E	6.2	9.7	11.1	0.11	0.000	0.11	0.000	0.00
30345E	1.9	2.7	3.0	0.11	0.041	0.11	0.009	0.20
38097E	5.5	7.3	8.1	0.11	0.000	0.11	0.000	0.00
19584E	4.3	4.5	4.5	0.09	0.005	0.08	0.001	0.03
10965E	0.9	2.0	2.4	0.06	0.094	0.06	0.008	0.19
00918E	5.5	6.2	6.4	0.06	0.001	0.06	0.000	0.00
29223E	3.3	3.3	3.4	0.06	0.018	0.06	0.002	0.05
07293E	1.0	2.5	3.1	0.06	0.052	0.06	0.005	0.12
24378E	0.3	2.6	3.6	0.06	0.012	0.06	0.005	0.11
37434E	0.5	1.9	2.5	0.06	0.103	0.06	0.009	0.21

(* Probabilities Assume All Destroyed and 70% of Unknown Vessels are Available)

Based on OPTN data as of July 30, 2010

TABLE 4: Biweekly Vessel & Transplant Statistics, with Probability of Vessel Shortage, by DSA
01SEP2008 - 31DEC2009 (34 bi-weekly periods)
Biweekly Statistics for the 34 Two-Week Periods
Sorted by (Descending) Number of Seropositive LI/KP/PA/IN Transplants

DSA	Biweekly Averages				Probabilities per Biweek*			Per Year*
	Destroyed	Dest + 70% of Unknowns	Destroyed + Unknowns	Sero+ transplants (LI,KP,PA,IN)	P(Zero Vessels)	P(1+ Transplants)	P(Potential Shortage)	P(Potential Shortage)
08976E	0.0	1.4	1.9	0.06	0.196	0.06	0.015	0.32
36312E	0.5	1.0	1.2	0.03	0.307	0.03	0.011	0.24
11373E	3.1	3.3	3.4	0.03	0.020	0.03	0.001	0.03
15402E	0.6	0.7	0.7	0.03	0.443	0.03	0.014	0.31
31161E	3.0	6.3	7.8	0.03	0.001	0.03	0.000	0.00
15708E	0.1	2.6	3.7	0.03	0.044	0.03	0.002	0.05
24021E	0.7	3.8	5.2	0.03	0.010	0.03	0.001	0.02
25296E	1.1	1.6	1.8	0.03	0.148	0.03	0.006	0.14
20655E	1.1	1.5	1.6	0.03	0.171	0.03	0.007	0.16
06885E	0.4	1.9	2.5	0.03	0.106	0.03	0.004	0.11
22695E	1.4	3.9	4.9	0.03	0.010	0.03	0.001	0.02
38658E	4.8	4.9	5.0	0.00	0.003	.	.	.
27234E	0.0	0.2	0.3	0.00	0.762	.	.	.
17901E	0.4	2.5	3.4	0.00	0.049	.	.	.
33915E	0.0	1.3	1.9	0.00	0.206	.	.	.
08262E	0.0	0.2	0.3	0.00	0.662	.	.	.
13056E	0.0	1.0	1.4	0.00	0.298	.	.	.
19890E	0.4	1.8	2.5	0.00	0.109	.	.	.
36669E	0.9	2.1	2.5	0.00	0.085	.	.	.
16269E	0.0	0.0	0.1	0.00	0.952	.	.	.
04437E	0.0	0.1	0.2	.	0.841	.	.	.
27183E	0.0	0.1	0.1	0.00	0.909	.	.	.
18615E	0.3	0.6	0.7	0.00	0.497	.	.	.
33405E	0.0	1.6	2.4	0.00	0.139	.	.	.
17748E	0.0	0.2	0.3	.	0.801	.	.	.
06783E	0.0	2.4	3.4	0.00	0.058	.	.	.

(* Probabilities Assume All Destroyed and 70% of Unknown Vessels are Available)

Based on OPTN data as of July 30, 2010

TABLE 4: Biweekly Vessel & Transplant Statistics, with Probability of Vessel Shortage, by DSA
01SEP2008 - 31DEC2009 (34 bi-weekly periods)
Biweekly Statistics for the 34 Two-Week Periods
Sorted by (Descending) Number of Seropositive LI/KP/PA/IN Transplants

DSA	Biweekly Averages				Probabilities per Biweek*			Per Year*
	Destroyed	Dest + 70% of Unknowns	Destroyed + Unknowns	Sero+ transplants (LI,KP,PA,IN)	P(Zero Vessels)	P(1+ Transplants)	P(Potential Shortage)	P(Potential Shortage)
28968E	1.8	3.2	3.8	0.00	0.022	.	.	.
05610E	4.0	5.1	5.6	0.00	0.002	.	.	.

(* Probabilities Assume All Destroyed and 70% of Unknown Vessels are Available)

Based on OPTN data as of July 30, 2010

TABLE 5: Vessel 'Potential Shortages' Probabilities, Accounting for ABO Incompatibility, by DSA
 01SEP2008 - 31DEC2009 (34 bi-weekly periods)
 Biweekly Statistics for the 34 Two-Week Periods
 Sorted by (Descending) Number of Seropositive LI/KP/PA/IN Transplants**

DSA	Ignoring ABO Incompatibility		Accounting for ABO Incompatibility	
	Per Biweek*	Per Year*	Per Biweek*	Per Year*
DSA	P(Potential Shortage)	P(Potential Shortage)	P(Potential Shortage)	P(Potential Shortage)
16218E	0.003	0.07	0.022	0.44
19737E	0.000	0.01	0.007	0.17
04590E	0.002	0.05	0.014	0.31
31467E	0.001	0.03	0.011	0.25
11016E	0.004	0.09	0.018	0.38
02142E	0.003	0.09	0.018	0.38
15963E	0.013	0.28	0.036	0.62
20604E	0.003	0.07	0.014	0.31
13821E	0.001	0.02	0.007	0.17
25755E	0.000	0.00	0.003	0.06
10608E	0.005	0.12	0.020	0.41
24582E	0.019	0.40	0.043	0.68
15198E	0.021	0.42	0.045	0.70
27693E	0.019	0.39	0.043	0.68
01020E	0.001	0.01	0.005	0.12
22848E	0.001	0.01	0.005	0.13
29580E	0.001	0.04	0.008	0.20
06987E	0.000	0.00	0.001	0.01
30345E	0.009	0.20	0.022	0.44
38097E	0.000	0.00	0.002	0.05
19584E	0.001	0.03	0.006	0.15
10965E	0.008	0.19	0.016	0.35
00918E	0.000	0.00	0.002	0.04
29223E	0.002	0.05	0.007	0.18
07293E	0.005	0.12	0.012	0.28
24378E	0.005	0.11	0.011	0.26

(* Probabilities Assume All Destroyed and 70% of Unknown Vessels are Available)

(** A2, A2B considered as A)

Based on OPTN data as of July 30, 2010

TABLE 5: Vessel 'Potential Shortages' Probabilities, Accounting for ABO Incompatibility, by DSA
 01SEP2008 - 31DEC2009 (34 bi-weekly periods)
 Biweekly Statistics for the 34 Two-Week Periods
 Sorted by (Descending) Number of Seropositive LI/KP/PA/IN Transplants**

DSA	Ignoring ABO Incompatibility		Accounting for ABO Incompatibility	
	Per Biweek*	Per Year*	Per Biweek*	Per Year*
DSA	P(Potential Shortage)	P(Potential Shortage)	P(Potential Shortage)	P(Potential Shortage)
37434E	0.009	0.21	0.017	0.36
08976E	0.015	0.32	0.024	0.46
36312E	0.011	0.24	0.015	0.33
11373E	0.001	0.03	0.004	0.10
15402E	0.014	0.31	0.018	0.38
31161E	0.000	0.00	0.001	0.02
15708E	0.002	0.05	0.006	0.14
24021E	0.001	0.02	0.003	0.07
25296E	0.006	0.14	0.010	0.24
20655E	0.007	0.16	0.011	0.25
06885E	0.004	0.11	0.009	0.20
22695E	0.001	0.02	0.003	0.07
38658E	.	.	.	.
27234E	.	.	.	.
17901E	.	.	.	.
33915E	.	.	.	.
08262E	.	.	.	.
13056E	.	.	.	.
19890E	.	.	.	.
36669E	.	.	.	.
16269E	.	.	.	.
04437E	.	.	.	.
27183E	.	.	.	.
18615E	.	.	.	.
33405E	.	.	.	.
17748E	.	.	.	.

(* Probabilities Assume All Destroyed and 70% of Unknown Vessels are Available)

(** A2, A2B considered as A)

Based on OPTN data as of July 30, 2010

TABLE 5: Vessel 'Potential Shortages' Probabilities, Accounting for ABO Incompatibility, by DSA
 01SEP2008 - 31DEC2009 (34 bi-weekly periods)
 Biweekly Statistics for the 34 Two-Week Periods
 Sorted by (Descending) Number of Seropositive LI/KP/PA/IN Transplants**

	Ignoring ABO Incompatibility		Accounting for ABO Incompatibility	
	Per Biweek*	Per Year*	Per Biweek*	Per Year*
DSA	P(Potential Shortage)	P(Potential Shortage)	P(Potential Shortage)	P(Potential Shortage)
06783E
28968E
05610E

(* Probabilities Assume All Destroyed and 70% of Unknown Vessels are Available)

(** A2, A2B considered as A)

Based on OPTN data as of July 30, 2010

TABLE 6: Vessel 'Potential Shortages' Probabilities, Accounting for ABO Incompatibility, by DSA
01SEP2008 - 31DEC2009 (34 bi-weekly periods)
Biweekly Statistics for the 34 Two-Week Periods
Sorted by (Descending) Annual Shortage Probability**

DSA	Ignoring ABO Incompatibility		Accounting for ABO Incompatibility	
	Per Biweek*	Per Year*	Per Biweek*	Per Year*
	P(Potential Shortage)	P(Potential Shortage)	P(Potential Shortage)	P(Potential Shortage)
15198E	0.021	0.42	0.045	0.70
24582E	0.019	0.40	0.043	0.68
27693E	0.019	0.39	0.043	0.68
15963E	0.013	0.28	0.036	0.62
08976E	0.015	0.32	0.024	0.46
30345E	0.009	0.20	0.022	0.44
16218E	0.003	0.07	0.022	0.44
10608E	0.005	0.12	0.020	0.41
11016E	0.004	0.09	0.018	0.38
02142E	0.003	0.09	0.018	0.38
15402E	0.014	0.31	0.018	0.38
37434E	0.009	0.21	0.017	0.36
10965E	0.008	0.19	0.016	0.35
36312E	0.011	0.24	0.015	0.33
20604E	0.003	0.07	0.014	0.31
04590E	0.002	0.05	0.014	0.31
07293E	0.005	0.12	0.012	0.28
24378E	0.005	0.11	0.011	0.26
20655E	0.007	0.16	0.011	0.25
31467E	0.001	0.03	0.011	0.25
25296E	0.006	0.14	0.010	0.24
06885E	0.004	0.11	0.009	0.20
29580E	0.001	0.04	0.008	0.20
29223E	0.002	0.05	0.007	0.18
13821E	0.001	0.02	0.007	0.17
19737E	0.000	0.01	0.007	0.17

(* Probabilities Assume All Destroyed and 70% of Unknown Vessels are Available)

(** A2, A2B considered as A)

Based on OPTN data as of July 30, 2010

TABLE 6: Vessel 'Potential Shortages' Probabilities, Accounting for ABO Incompatibility, by DSA
01SEP2008 - 31DEC2009 (34 bi-weekly periods)
Biweekly Statistics for the 34 Two-Week Periods
Sorted by (Descending) Annual Shortage Probability**

	Ignoring ABO Incompatibility		Accounting for ABO Incompatibility	
	Per Biweek*	Per Year*	Per Biweek*	Per Year*
DSA	P(Potential Shortage)	P(Potential Shortage)	P(Potential Shortage)	P(Potential Shortage)
19584E	0.001	0.03	0.006	0.15
15708E	0.002	0.05	0.006	0.14
22848E	0.001	0.01	0.005	0.13
01020E	0.001	0.01	0.005	0.12
11373E	0.001	0.03	0.004	0.10
24021E	0.001	0.02	0.003	0.07
22695E	0.001	0.02	0.003	0.07
25755E	0.000	0.00	0.003	0.06
38097E	0.000	0.00	0.002	0.05
00918E	0.000	0.00	0.002	0.04
31161E	0.000	0.00	0.001	0.02
06987E	0.000	0.00	0.001	0.01
38658E	.	.	.	.
27234E	.	.	.	.
17901E	.	.	.	.
33915E	.	.	.	.
08262E	.	.	.	.
13056E	.	.	.	.
19890E	.	.	.	.
36669E	.	.	.	.
16269E	.	.	.	.
04437E	.	.	.	.
27183E	.	.	.	.
18615E	.	.	.	.
33405E	.	.	.	.
17748E	.	.	.	.

(* Probabilities Assume All Destroyed and 70% of Unknown Vessels are Available)

(** A2, A2B considered as A)

Based on OPTN data as of July 30, 2010

TABLE 6: Vessel 'Potential Shortages' Probabilities, Accounting for ABO Incompatibility, by DSA
01SEP2008 - 31DEC2009 (34 bi-weekly periods)
Biweekly Statistics for the 34 Two-Week Periods
Sorted by (Descending) Annual Shortage Probability**

	Ignoring ABO Incompatibility		Accounting for ABO Incompatibility	
	Per Biweek*	Per Year*	Per Biweek*	Per Year*
DSA	P(Potential Shortage)	P(Potential Shortage)	P(Potential Shortage)	P(Potential Shortage)
06783E
28968E
05610E

(* Probabilities Assume All Destroyed and 70% of Unknown Vessels are Available)

(** A2, A2B considered as A)

Based on OPTN data as of July 30, 2010

TABLE 7: Sensitivity Analysis (6 Scenarios)
Vessel 'Potential Shortages' Probabilities, Accounting for ABO Incompatibility, by DSA**
01SEP2008 - 31DEC2009 (34 bi-weekly periods)
Biweekly Statistics for the 34 Two-Week Periods
Sorted by (Descending) Annual Shortage Probability

	One-Year Potential Shortage Probabilities, Accounting for ABO Incompatibility					
DSA	Baseline Scenario	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
15198E	0.70	0.83	0.53	0.70	0.60	0.41
24582E	0.68	0.75	0.60	0.01	0.00	0.00
27693E	0.68	0.82	0.50	0.68	0.57	0.38
15963E	0.62	0.74	0.47	0.62	0.49	0.34
08976E	0.46	0.55	0.37	0.46	0.41	0.31
30345E	0.44	0.49	0.39	0.44	0.35	0.30
16218E	0.44	0.64	0.25	0.08	0.03	0.01
10608E	0.41	0.55	0.27	0.41	0.29	0.17
11016E	0.38	0.65	0.18	0.38	0.25	0.09
02142E	0.38	0.42	0.34	0.38	0.25	0.21
15402E	0.38	0.38	0.38	0.38	0.36	0.35
37434E	0.36	0.44	0.28	0.36	0.30	0.22
10965E	0.35	0.40	0.29	0.35	0.29	0.23
36312E	0.33	0.35	0.30	0.33	0.29	0.26
20604E	0.31	0.49	0.17	0.31	0.20	0.09
04590E	0.31	0.48	0.16	0.31	0.18	0.08
07293E	0.28	0.34	0.21	0.28	0.22	0.16
24378E	0.26	0.36	0.17	0.15	0.10	0.05
20655E	0.25	0.27	0.23	0.25	0.22	0.20
31467E	0.25	0.38	0.15	0.25	0.14	0.07
25296E	0.24	0.26	0.22	0.24	0.20	0.18
06885E	0.20	0.26	0.15	0.20	0.17	0.12
29580E	0.20	0.21	0.19	0.20	0.12	0.12
29223E	0.18	0.18	0.17	0.18	0.12	0.12

Baseline: Vessels Sent=As Reported, Vessels Available=Destroyed + 70% of Unknowns

Scenario 1: Vessels Sent=As Reported, Vessels Available=Destroyed + 50% of Unknowns

Scenario 2: Vessels Sent=As Reported, Vessels Available=Destroyed + 95% of Unknowns

Scenario 3: Vessels Sent=Boost 7 Outlier DSAs, Vessels Available=Destroyed + 70% of Unknowns

Scenario 4: Vessels Sent=Boost 7 Outliers + All by 20%, Vessels Available=Destroyed + 70% of Unknowns

Scenario 5: Vessels Sent=Boost 7 Outliers + All by 20%, Vessels Available=Destroyed + 95% of Unknowns

Based on OPTN data as of July 30, 2010

TABLE 7: Sensitivity Analysis (6 Scenarios)
Vessel 'Potential Shortages' Probabilities, Accounting for ABO Incompatibility, by DSA**
01SEP2008 - 31DEC2009 (34 bi-weekly periods)
Biweekly Statistics for the 34 Two-Week Periods
Sorted by (Descending) Annual Shortage Probability

	One-Year Potential Shortage Probabilities, Accounting for ABO Incompatibility					
DSA	Baseline Scenario	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
13821E	0.17	0.27	0.10	0.17	0.10	0.05
19737E	0.17	0.25	0.10	0.11	0.05	0.02
19584E	0.15	0.15	0.14	0.15	0.09	0.09
15708E	0.14	0.20	0.08	0.14	0.10	0.06
22848E	0.13	0.24	0.06	0.13	0.07	0.03
01020E	0.12	0.23	0.05	0.12	0.07	0.02
11373E	0.10	0.10	0.09	0.10	0.07	0.06
24021E	0.07	0.11	0.04	0.07	0.05	0.02
22695E	0.07	0.10	0.04	0.07	0.05	0.03
25755E	0.06	0.09	0.05	0.03	0.01	0.01
38097E	0.05	0.06	0.03	0.05	0.02	0.01
00918E	0.04	0.05	0.04	0.04	0.02	0.02
31161E	0.02	0.03	0.01	0.02	0.01	0.00
06987E	0.01	0.02	0.01	0.01	0.01	0.00
38658E	.	.	.	.	.	.
27234E	.	.	.	.	.	.
17901E	.	.	.	.	.	.
33915E	.	.	.	.	.	.
08262E	.	.	.	.	.	.
13056E	.	.	.	.	.	.
19890E	.	.	.	.	.	.
36669E	.	.	.	.	.	.
16269E	.	.	.	.	.	.
04437E	.	.	.	.	.	.

Baseline: Vessels Sent=As Reported, Vessels Available=Destroyed + 70% of Unknowns

Scenario 1: Vessels Sent=As Reported, Vessels Available=Destroyed + 50% of Unknowns

Scenario 2: Vessels Sent=As Reported, Vessels Available=Destroyed + 95% of Unknowns

Scenario 3: Vessels Sent=Boost 7 Outlier DSAs, Vessels Available=Destroyed + 70% of Unknowns

Scenario 4: Vessels Sent=Boost 7 Outliers + All by 20%, Vessels Available=Destroyed + 70% of Unknowns

Scenario 5: Vessels Sent=Boost 7 Outliers + All by 20%, Vessels Available=Destroyed + 95% of Unknowns

Based on OPTN data as of July 30, 2010

TABLE 7: Sensitivity Analysis (6 Scenarios)
Vessel 'Potential Shortages' Probabilities, Accounting for ABO Incompatibility, by DSA**
01SEP2008 - 31DEC2009 (34 bi-weekly periods)
Biweekly Statistics for the 34 Two-Week Periods
Sorted by (Descending) Annual Shortage Probability

	One-Year Potential Shortage Probabilities, Accounting for ABO Incompatibility					
DSA	Baseline Scenario	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
27183E
18615E
33405E
17748E
06783E
28968E
05610E

Baseline: Vessels Sent=As Reported, Vessels Available=Destroyed + 70% of Unknowns

Scenario 1: Vessels Sent=As Reported, Vessels Available=Destroyed + 50% of Unknowns

Scenario 2: Vessels Sent=As Reported, Vessels Available=Destroyed + 95% of Unknowns

Scenario 3: Vessels Sent=Boost 7 Outlier DSAs, Vessels Available=Destroyed + 70% of Unknowns

Scenario 4: Vessels Sent=Boost 7 Outliers + All by 20%, Vessels Available=Destroyed + 70% of Unknowns

Scenario 5: Vessels Sent=Boost 7 Outliers + All by 20%, Vessels Available=Destroyed + 95% of Unknowns

Based on OPTN data as of July 30, 2010

TABLE 8: Sensitivity Analysis (6 Scenarios)
Vessel 'Actual Shortages' Probabilities, Accounting for ABO Incompatibility, by DSA
01SEP2008 - 31DEC2009 (34 bi-weekly periods)
Biweekly Statistics for the 34 Two-Week Periods

	One-Year Actual Shortage Probabilities, Accounting for ABO Incompatibility					
DSA	Baseline Scenario	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
15198E	0.11	0.16	0.07	0.11	0.09	0.05
24582E	0.11	0.13	0.08	0.00	0.00	0.00
27693E	0.10	0.16	0.06	0.10	0.08	0.04
15963E	0.09	0.12	0.06	0.09	0.06	0.04
08976E	0.06	0.08	0.05	0.06	0.05	0.04
30345E	0.06	0.06	0.05	0.06	0.04	0.03
16218E	0.04	0.07	0.02	0.00	0.00	0.00
10608E	0.05	0.07	0.03	0.05	0.03	0.02
11016E	0.04	0.09	0.02	0.04	0.02	0.01
02142E	0.04	0.05	0.04	0.04	0.02	0.02
15402E	0.05	0.05	0.05	0.05	0.04	0.04
37434E	0.04	0.06	0.03	0.04	0.04	0.02
10965E	0.04	0.05	0.03	0.04	0.03	0.03
36312E	0.04	0.04	0.03	0.04	0.03	0.03
20604E	0.03	0.06	0.02	0.03	0.02	0.01
04590E	0.03	0.06	0.01	0.03	0.02	0.01
07293E	0.03	0.04	0.02	0.03	0.02	0.02
24378E	0.03	0.04	0.02	0.02	0.01	0.00
20655E	0.03	0.03	0.03	0.03	0.02	0.02
31467E	0.02	0.04	0.01	0.02	0.01	0.01
25296E	0.03	0.03	0.02	0.03	0.02	0.02
06885E	0.02	0.03	0.02	0.02	0.02	0.01
29580E	0.02	0.02	0.02	0.02	0.01	0.01
29223E	0.02	0.02	0.02	0.02	0.01	0.01

Baseline: Vessels Sent=As Reported, Vessels Available=Destroyed + 70% of Unknowns

Scenario 1: Vessels Sent=As Reported, Vessels Available=Destroyed + 50% of Unknowns

Scenario 2: Vessels Sent=As Reported, Vessels Available=Destroyed + 95% of Unknowns

Scenario 3: Vessels Sent=Boost 7 Outlier DSAs, Vessels Available=Destroyed + 70% of Unknowns

Scenario 4: Vessels Sent=Boost 7 Outliers + All by 20%, Vessels Available=Destroyed + 70% of Unknowns

Scenario 5: Vessels Sent=Boost 7 Outliers + All by 20%, Vessels Available=Destroyed + 95% of Unknowns

Based on OPTN data as of July 30, 2010

TABLE 8: Sensitivity Analysis (6 Scenarios)
Vessel 'Actual Shortages' Probabilities, Accounting for ABO Incompatibility, by DSA
01SEP2008 - 31DEC2009 (34 bi-weekly periods)
Biweekly Statistics for the 34 Two-Week Periods

	One-Year Actual Shortage Probabilities, Accounting for ABO Incompatibility					
DSA	Baseline Scenario	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
13821E	0.02	0.03	0.01	0.02	0.01	0.00
19737E	0.01	0.02	0.01	0.01	0.00	0.00
19584E	0.02	0.02	0.01	0.02	0.01	0.01
15708E	0.01	0.02	0.01	0.01	0.01	0.01
22848E	0.01	0.03	0.01	0.01	0.01	0.00
01020E	0.01	0.02	0.00	0.01	0.01	0.00
11373E	0.01	0.01	0.01	0.01	0.01	0.01
24021E	0.01	0.01	0.00	0.01	0.00	0.00
22695E	0.01	0.01	0.00	0.01	0.00	0.00
25755E	0.01	0.01	0.00	0.00	0.00	0.00
38097E	0.00	0.01	0.00	0.00	0.00	0.00
00918E	0.00	0.00	0.00	0.00	0.00	0.00
31161E	0.00	0.00	0.00	0.00	0.00	0.00
06987E	0.00	0.00	0.00	0.00	0.00	0.00
38658E	.	.	.	.	.	.
27234E	.	.	.	.	.	.
17901E	.	.	.	.	.	.
33915E	.	.	.	.	.	.
08262E	.	.	.	.	.	.
13056E	.	.	.	.	.	.
19890E	.	.	.	.	.	.
36669E	.	.	.	.	.	.
16269E	.	.	.	.	.	.
04437E	.	.	.	.	.	.

Baseline: Vessels Sent=As Reported, Vessels Available=Destroyed + 70% of Unknowns

Scenario 1: Vessels Sent=As Reported, Vessels Available=Destroyed + 50% of Unknowns

Scenario 2: Vessels Sent=As Reported, Vessels Available=Destroyed + 95% of Unknowns

Scenario 3: Vessels Sent=Boost 7 Outlier DSAs, Vessels Available=Destroyed + 70% of Unknowns

Scenario 4: Vessels Sent=Boost 7 Outliers + All by 20%, Vessels Available=Destroyed + 70% of Unknowns

Scenario 5: Vessels Sent=Boost 7 Outliers + All by 20%, Vessels Available=Destroyed + 95% of Unknowns

Based on OPTN data as of July 30, 2010

TABLE 8: Sensitivity Analysis (6 Scenarios)
Vessel 'Actual Shortages' Probabilities, Accounting for ABO Incompatibility, by DSA
01SEP2008 - 31DEC2009 (34 bi-weekly periods)
Biweekly Statistics for the 34 Two-Week Periods

	One-Year Actual Shortage Probabilities, Accounting for ABO Incompatibility					
DSA	Baseline Scenario	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
27183E
18615E
33405E
17748E
06783E
28968E
05610E

Baseline: Vessels Sent=As Reported, Vessels Available=Destroyed + 70% of Unknowns

Scenario 1: Vessels Sent=As Reported, Vessels Available=Destroyed + 50% of Unknowns

Scenario 2: Vessels Sent=As Reported, Vessels Available=Destroyed + 95% of Unknowns

Scenario 3: Vessels Sent=Boost 7 Outlier DSAs, Vessels Available=Destroyed + 70% of Unknowns

Scenario 4: Vessels Sent=Boost 7 Outliers + All by 20%, Vessels Available=Destroyed + 70% of Unknowns

Scenario 5: Vessels Sent=Boost 7 Outliers + All by 20%, Vessels Available=Destroyed + 95% of Unknowns

Based on OPTN data as of July 30, 2010